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Debt Sustainability and direction of trade: What does Africa's shifting engagement with BRIC and OECD tells us? *

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Abstract

This study assesses the evolution of debt sustainability in the Sub Saharan African (SSA) region. It also examines the respective contributions of OECD and BRIC to debt sustainability in the region. We reveal how the external demand for SSA goods and services from OECD and BRIC helps to lower 'debt-to-exports' and 'debt-service-to-exports' ratios, two of the main gauges of debt sustainability. Furthermore, using simple growth accounting, we assess how the net exports by SSA to the OECD and BRIC contributes to the region's GDP growth, and thus indirectly helps to lower the 'debt-to-GDP' ratio, which is another important measure of indebtedness. Our study also compares the 'actual' debt levels of SSA with 'hypothetical' debt levels that simulate the contributions of OECD and BRIC. On the basis of debt sustainability thresholds of the joint IMF-World Bank Debt Sustainability Framework (DSF), we test how the sustainability of SSA debt has evolved overtime and how much the OECD and BRIC contribute to three classes of 'weak', 'medium' and 'strong' debt sustainability targets.

Key words: debt sustainability, threshold effects, international trade, Growth Accounting

JEL Classification: E01, E62, F34, H63, O11, P33

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1. Introduction

As noted by the IMF & World Bank (2012), there is a large external financing requirement in African countries. Local sources of finance are insufficient to cover the investment gap in infrastructure, education and social services. For instance, the present annual spending on infrastructure is about US\$45 billion, while an estimated 90 to 100 billion USD is needed. Since aid money is limited, developing countries are increasingly looking for alternative channels, including non-concessional external borrowing. For instance, external financial flows to Africa are estimated to have reached close to 200 billion USD in 2013 (AfDB, OECD and UNDP, 2015). However, given the recent history of debt relief in these countries (Easterly, 2002; Ndikumana, 2004; Cassimon & Essers, 2013; Cassimon & Verbeke, 2014), non-concessional lending to African countries by OECD countries is limited.

Brazil, Russia, India and China (i.e. BRIC) countries represent the largest and most important emerging market economies of the world. This group of countries (China in particular) is increasingly competing with the OECD countries as major trading partners of African countries (De Grauwe, Houssa and Piccillo, 2012).¹ Further, they are also serving as a growing source of finance - be it aid grants or loans on concessional and non-concessional terms. The loan pledges at successive 'Forum on China Africa Cooperation' (FOCAC) summits are exemplary of these shifts. For instance, USD 5, 10 and 20 billion in loans were announced at the third (2006), fourth (2009) and fifth (2012) FOCAC summits, respectively (FOCAC, 2015). However, the growing role of financing which is flowing from BRIC to African low income countries (LICs) is rekindling 'debt worries', where years of efforts by OECD creditors, the IMF and World Bank in achieving debt sustainability in the region are being undermined (Reisen & Ndoye, 2008).

Given the apparent importance of BRIC and OECD economic blocks to SSA, the basic objective of this study is to assess various aspects of external public debt sustainability vis-à-vis Africa's shifting trade engagement with its BRIC and traditional OECD partners. In the analysis, we also focus on trade links since some of the core debt sustainability measures are certain ratios of debt and exports, e.g. 'debt-to-exports' and 'debt-service-to-exports' (see section 3). Further, given the significant link between exports and GDP cycles in SSA economies (Gurara and Ncube, 2013; Diallo and Tapsoba, 2014), the trade links with OECD and BRIC could have an effect on the 'debt-to-GDP' ratio. This latter ratio is in fact the prominently used measure of indebtedness as its level signifies whether a country is able to easily service its debt or not. In this regard, we first analyze to what extent BRIC and OECD countries are contributing to African exports and GDP growth. We then test how much this export and GDP growth contributes to maintaining the debt sustainability benchmarks set by the joint IMF-World Bank Debt Sustainability Framework (DSF).

¹ This paper uses the same definition and country list as World Bank and IMF in its use of the term 'OECD', i.e. Organization of Economic Development. This group of countries largely represents the world's most advanced countries that have been SSA's traditional economic partners. In its current form, the specific list of countries in the group includes; Australia, Japan, Austria, Korea Rep., Belgium, Luxembourg, Canada, Mexico, Chile, Netherlands, Czech Republic, New Zealand, Denmark, Norway, Estonia, Poland, Finland, Portugal, France, Slovak Republic, Germany, Slovenia, Greece, Spain, Hungary, Sweden, Iceland, Switzerland, Ireland, Turkey, Israel, United Kingdom, Italy, and United States.

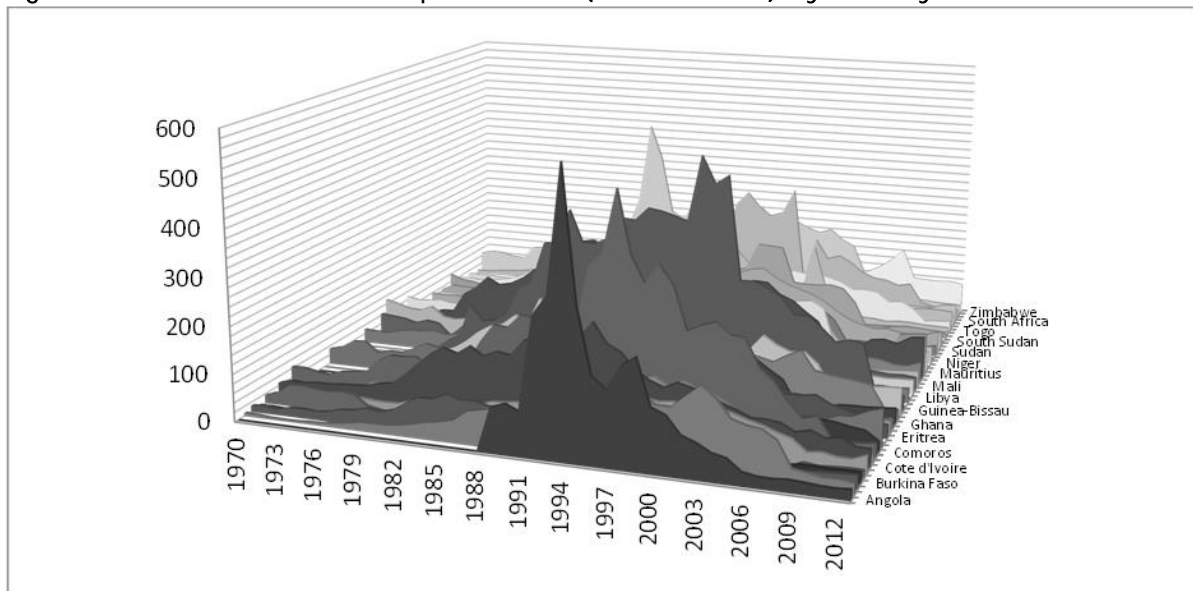
The analysis is based on annual bilateral trade data gathered from IMF's Direction of Trade (DOTS) dataset; gross FDI net inflows data from World Bank's World Development Indicators (WDI) dataset; bilateral FDI data from UNCTAD; National accounts data from the World Bank's and OECD's National Accounts datasets; Debt indicators from the World Bank's International Debt Statistics (IDS) and country policy scores from the World Bank's Country Policy and Institutional Assessment (CPIA) database.

2. Debt evolution and debt sustainability framework

2.1 Evolution of debt

Debt rose steeply as a percentage of GDP across SSA countries through the 1970s and 1980s before exploding in the early 1990s (Figure 1). It then started its equally steep descent in the late 1990s and early 2000s, mostly due to grand debt relief schemes such as the HIPC initiative (Van Campenhout and Cassimon, 2007; Cassimon and Essers, 2013).

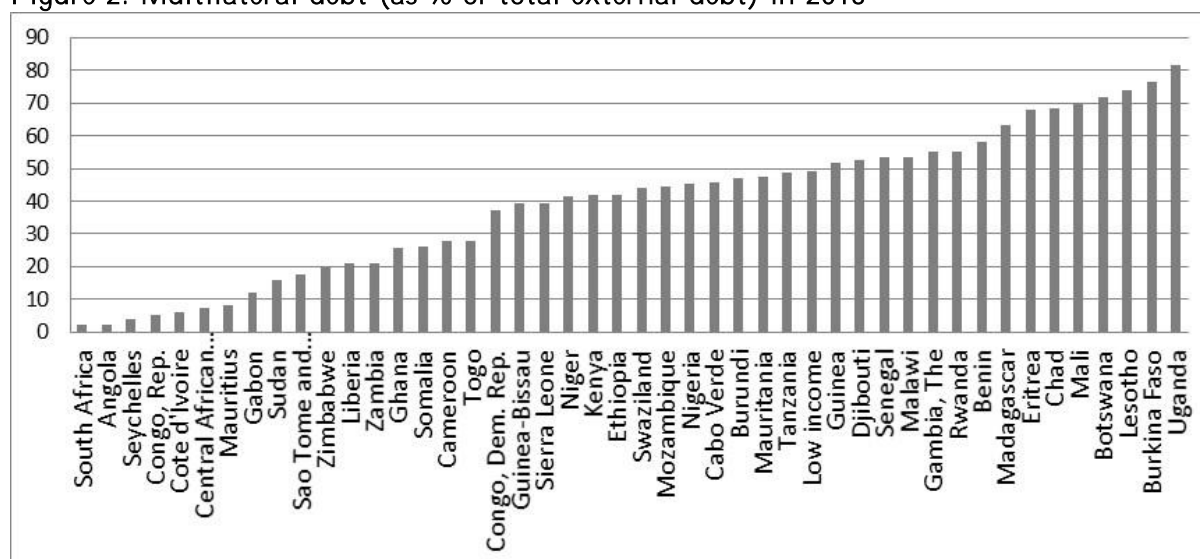
Figure 1: Evolution of external public debt (as % of GDP) by country



Source: based on World Bank's IDS database

It is important to note that for many SSA countries a large portion of the external debt owed has been to multilateral creditors such as the IMF, the World Bank and African Development Bank. As can be seen from Figure 2, multilateral debt constituted more than 50% of overall external public debt in almost half of SSA countries in 2013. Further, it accounted for 40% or more in nearly two thirds of SSA countries. Generally speaking, the proportions of multilateral debt in overall debt are greater in SSA's poorer economies than in relatively more developed countries like South Africa and Mauritius, and resource-rich countries such as Angola, Gabon, and the Republic of Congo.

Figure 2: Multilateral debt (as % of total external debt) in 2013



Source: based on World Bank's IDS database

2.2 The Debt Sustainability Framework (DSF)

The DSF was introduced in 2005 as a framework enabling the IMF and World Bank to conduct external (and public) debt sustainability analysis (DSA) for LICs in a standardized manner (IMF & WB, 2012).² Apart from helping to improve LIC borrowing behavior, the DSF also guides various bilateral and multilateral donors-creditors in their grant and loan disbursement decisions.³

The DSF compares the external public (and publicly guaranteed debt stocks and service of LICs against various thresholds. If debt levels (measured against GDP, exports and revenue) are all below the suggested thresholds, then a country's given level of debt is assumed to be sustainable (see Annex 1). However, to address the heterogeneity of developing countries, the framework sets different thresholds depending on whether countries have 'weak', 'medium' or 'strong' policy scores. The country policy scores used in the DSF come from the World Bank's Country Policy and Institutional Assessment (CPIA) index. The LICs that score better on CPIA are assigned higher debt sustainability thresholds. The underlying assumption is countries with 'strong' policies and institutions are better placed to withstand macroeconomic shocks compared to 'weaker' ones (Dabla-Norris and Gunduz, 2014; Megersa and Cassimon, 2015).

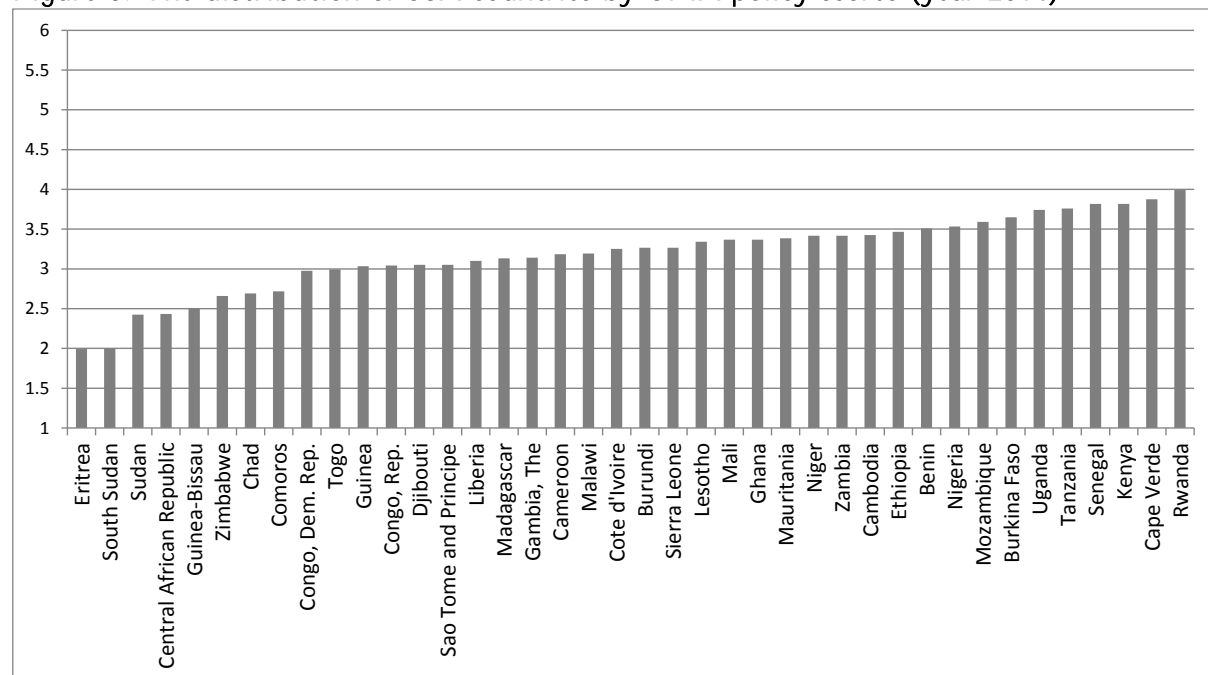
Figure 3 indicates that most SSA LICs have relatively low CPIA scores. The majority of countries score below the CPIA median of 3.5, falling in the weak (≤ 3.25) or lower medium (3.25 to 3.5) CPIA range. This implies low debt sustainability thresholds for most SSA countries. As of 2014, Eritrea and South Sudan, for example, have to keep their debts below 30% of GDP and 100% of exports according to the DSF. Conversely, countries such as Rwanda and Kenya which

² External debt (also known as foreign debt) represents the gross debt owed to foreign creditors by a country. Public debt (alternatively termed as sovereign debt or national debt) signifies the debt owed by national governments.

³ The DSF uses 'present value' (PV) in its analysis of debt sustainability and in setting sustainability targets (thresholds). However, empirical studies often use nominal debt figures since adequate long term PV debt data is not readily available. This study will also use nominal debt data which is available from the World Bank's IDS database. Yet, the study will borrow the debt sustainability thresholds of the DSF as rough guidelines of sustainability.

have - by SSA standards - relatively robust technocratic institutions and high-quality policy may accumulate debt up to 50% of GDP and 200% of exports without causing alarms of debt distress.

Figure 3: The distribution of SSA countries by CPIA policy scores (year 2014)



Source: based on World Bank's CPIA database

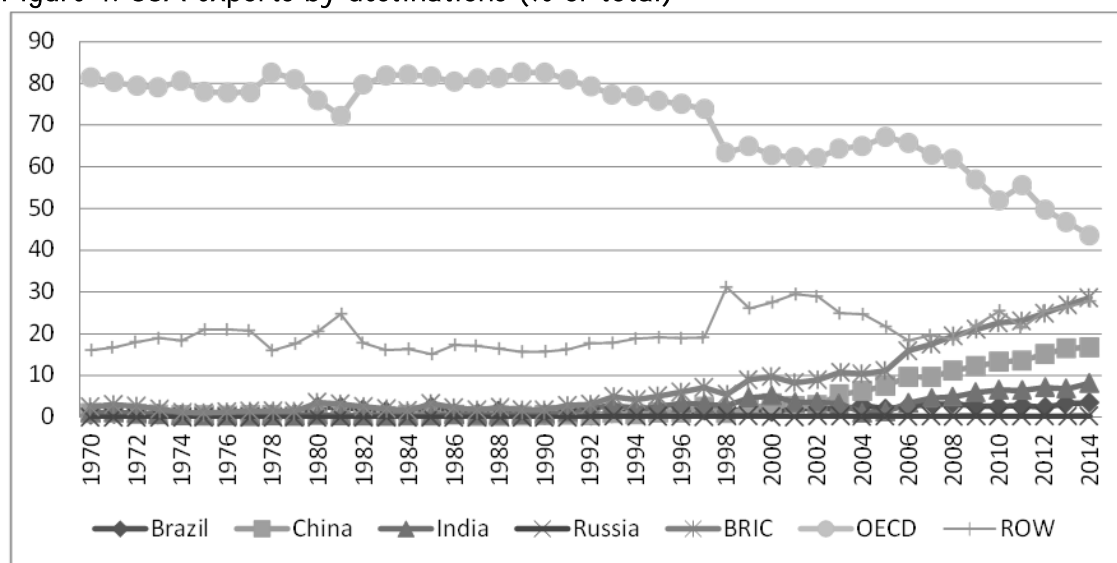
3. Debt sustainability analysis through contributions of OECD & BRIC to export and GDP growth

3.1 The Export Channel

While examining the contributions of BRIC and OECD to the export growth witnessed in African countries, we first split the total exports by African countries on the basis of its destination. Specifically, we split gross exports of SSA in to BRIC, OECD and rest of the world (ROW).

As can be seen in Figure 4, the OECD countries have been serving as prime destinations of SSA exports. Almost 80% of exports (by value) used to go to the OECD up until the beginning of the 1990s. In the meantime, BRIC have risen from well below 5% before the beginning of the 1990s to assume almost 30% of exports in 2014. The primary player in the club of BRIC (by a huge margin) is China, which in 2014 received almost 17% of SSA exports. In the same year, India trailed behind China at about 8%. As could be seen from the figure, since 2008 BRIC received nearly as much of SSA's exports as the rest of the world combined, excluding the OECD. Based on current trajectories, BRIC might overtake the OECD as the biggest export market of SSA countries. For the moment, at least, the OECD countries remain the major export market and receive over 40% of SSA's exports.

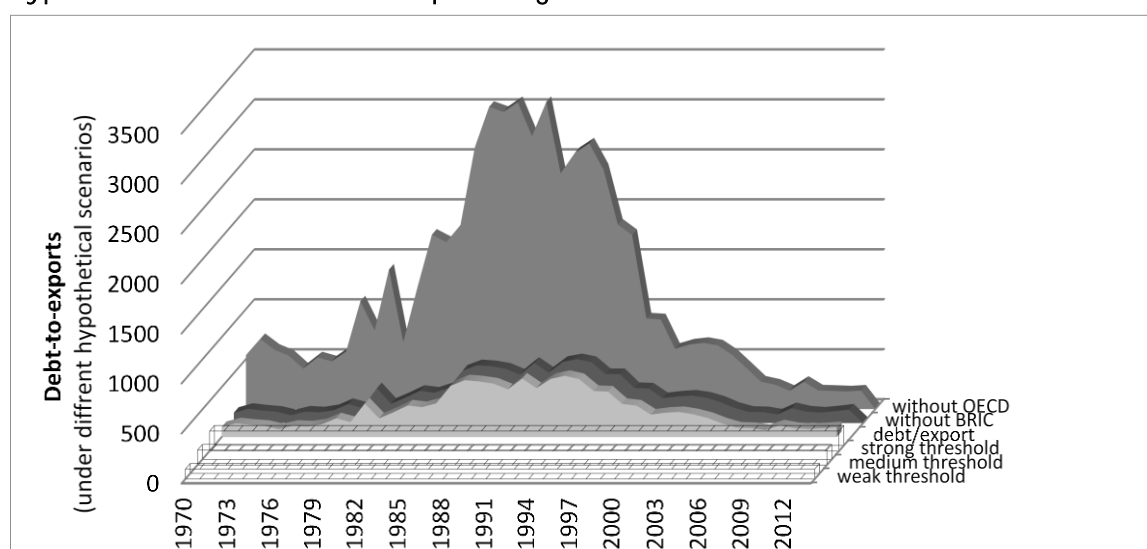
Figure 4: SSA exports by destinations (% of total)



Source: based on IMF's DOTS database

Looking at debt to exports ratio (Figures 5 and 6) and debt service to exports ratio (Figures 7 and 8), the OECD countries appear to have an overwhelming impact on SSA's debt sustainability. This is so since the OECD were by far the largest export destinations for SSA, especially until the early 2000s. In recent years, however, BRIC (particularly China and India) are catching up fast. Figure 4 clearly shows these reversing trends of SSA's export destinations. Yet, it should be noted that the OECD are still the biggest export destinations, at least for the moment.

Figure 5: SSA's debt to exports ratio (%) together with sustainability thresholds & hypothetical scenarios of 'no export to given destination'

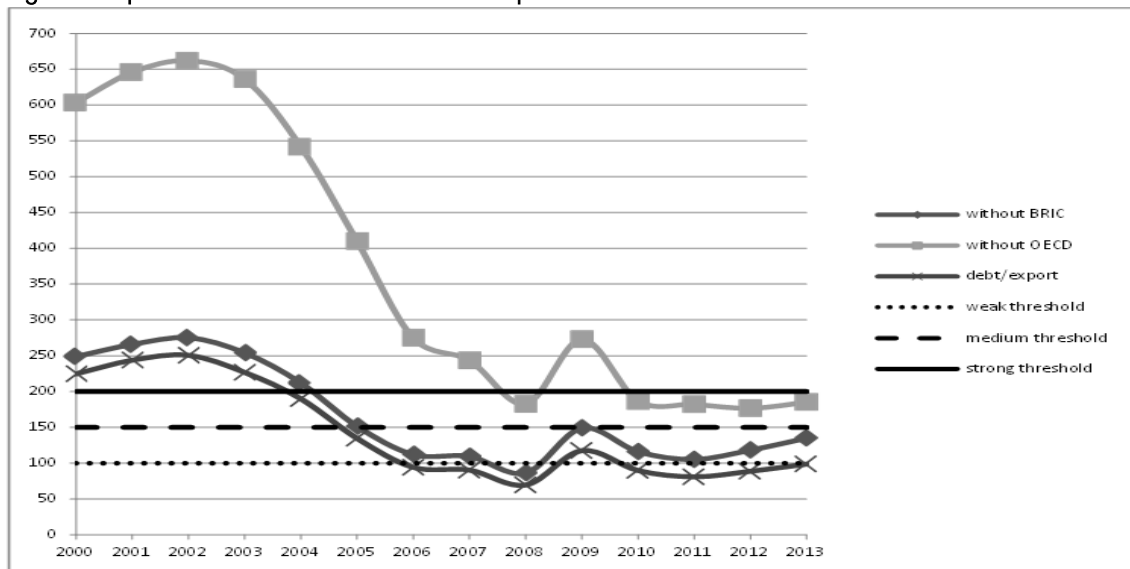


Source: based on World Bank's IDS and IMF's DOTS databases

Figure 6 below delivers similar information to Figure 5. While the former graph is good at giving the longer term (1970-2014) evolution of debt to exports ratio, it is difficult to reveal recent

trends in the debt sustainability landscape and the relative contributions of OECD and BRIC. This is especially made difficult by the very high ‘actual’ and ‘hypothetical’ (i.e. simulated) levels of debt to exports in the period between early 1980s to early 2000s. As can be seen in Figure 5, the ‘hypothetical’ graph of debt to exports ratio (i.e. the one that excludes exports to OECD) spikes to exorbitant levels in the same period. As we noted above, this emanates from the duality of high debt levels in SSA and near total export market domination by OECD in this period. For instance, the OECD used to receive about 80 % of SSA’s exports up until early 1990s (see Figure 4).

Figure 6: post 2000 trend of debt to exports



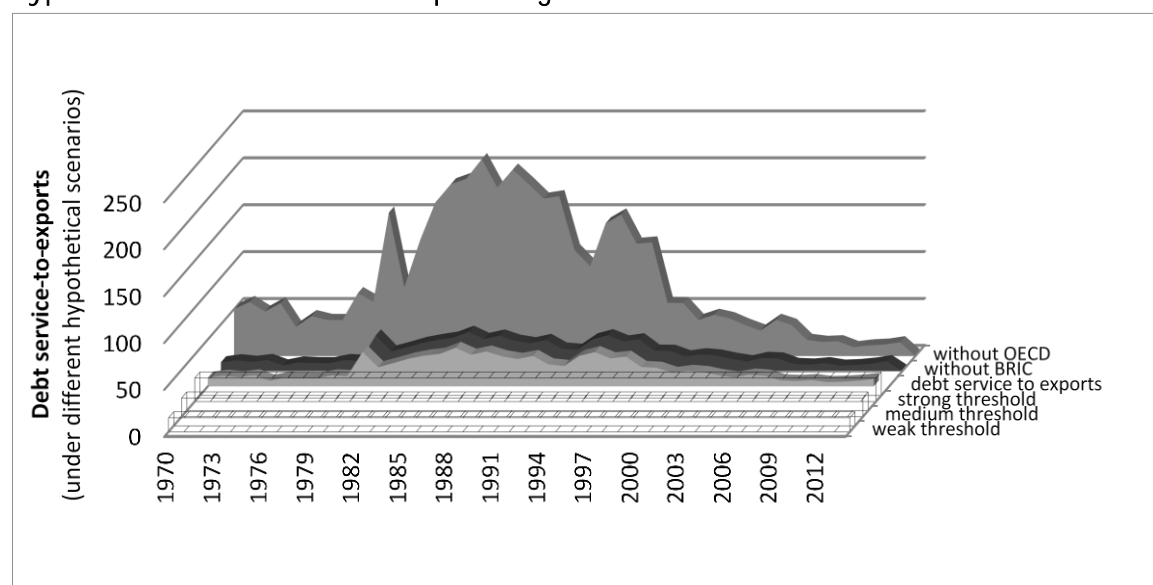
Source: based on World Bank’s IDS and IMF’s DOTS databases

Looking at the recent trends in debt to exports (as shown in Figure 6), we notice that the average debt to exports figures for SSA countries have been sustainable since 2004, using the ‘strong’ debt sustainability threshold. However, given the low policy and institutional rating of most SSA countries, the safest threshold would be the one marked as the ‘weak’ debt sustainability threshold (see the CPIA ratings of SSA countries in Figure 3). Going by this stricter standard, we could say that debt to export figures have been sustainable since 2006. We see one interesting exception where debt to export figures spiked briefly and crossed the threshold in 2009. This corresponds to the global financial crisis where African exports were severely depressed due to recessions in most countries, especially OECD. Looking at the alternative hypothetical scenarios of no exports to OECD and BRIC, we still notice that the exclusion of OECD to have a bigger detrimental impact towards debt sustainability, when debt is measured against export levels. However, even in the short span of the 14 years shown in Figure 6, the growing convergence between OECD and BRIC is unmistakably seen. For instance, the exclusion of the OECD (unlike BRIC) made debt extremely unsustainable say in 2003, as compared to 2013.

Analysis of debt service to exports

Looking at the debt service to exports ratio (Figure 7) and the detailed developments in the post 2000 period (Figure 8), one notices a trend which is similar to the analysis of debt to exports which we made above. Starting with the actual debt service to export ratios, we see well over 25% of export returns servicing debt from about the beginning of the 1980s up to the late 1990s (see Figure 7). This makes the debt profiles of SSA countries in that period highly unsustainable. Going to our analysis of debt service to exports ratio in the hypothetical scenario of no exports to OECD and BRIC, we see that debt service to export ratio would be enormously elevated when we exclude exports to OECD, as compared to BRIC. As mentioned in our foregoing analysis, this is again explained by the dominance of OECD as SSA's export market in this period.

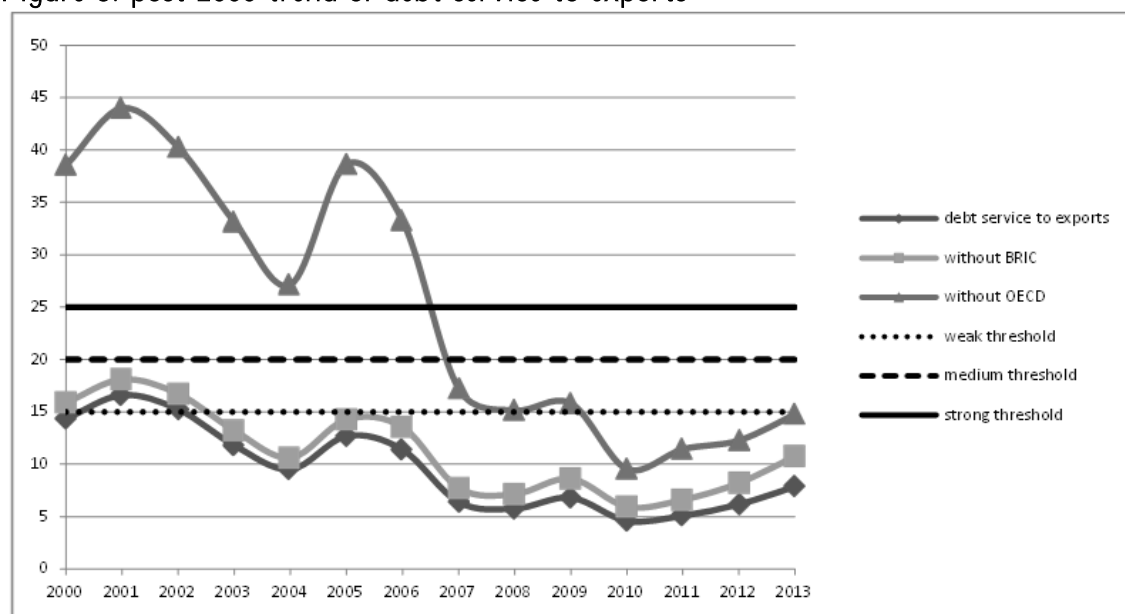
Figure 7: SSA's debt service to exports ratio (%) together with sustainability thresholds & hypothetical scenarios of 'no export to given destination'



Source: based on World Bank's IDS and IMF's DOTS databases

Focusing on recent trends of debt service to exports, we see that the relative impact of the OECD towards debt sustainability (measured in terms of debt service to export ratio) has been rapidly matched by BRIC. However, the OECD countries still make a relatively bigger impact. Further, we also notice that, unlike the 1980s and 1990s, debt service to export ratio has largely been within 'sustainable' threshold bands. In fact, since mid-2000s the debt profile of SSA (measured on 'debt service to exports') has been exceptionally good that the hypothetical exclusion of exports either to OECD or BRIC fails to drive the ratio to unsustainable territories.

Figure 8: post 2000 trend of debt service to exports



Source: based on World Bank's IDS and IMF's DOTS databases

3.2 The GDP Channel

Table 1 gives the estimated contributions of net exports to OECD and BRIC to the GDP growth of SSA (refer to Annex 2 concerning the growth accounting used in the analysis).⁴ The table spans the 1970-2014 time period. The second and third columns of the table show the net exports to BRIC and OECD, respectively, as a ratio of GDP. It is difficult to compare OECD and BRIC on the size of this ratio. The size of the ratio does not necessarily reflect a bigger role for the respective trade partner. For instance, in the 1970s and 80s the exports to OECD were very large as compared to those of BRIC. However, since the imports from OECD were often equally large, the net exports will appear small. Yet, no matter how skewed the trade balance might be, the net exports (deficit or surplus) to BRIC had never exceeded the half billion USD mark until 1998 and the one billion USD mark until 2000. On the other hand, the net export to the OECD has been quite high even as far back as the 1970s, especially in the years of significant trade surplus or deficit. For instance, in 1974 net exports surplus was nearly 6 billion USD and in multiple fiscal years it was in excess of 2 or 3 billion USD.

Further, looking at column 2, we notice that the net exports to BRIC had been predominantly negative up until the late 1990s. This shows that SSA economies have been importing more from BRIC than exporting to them in this period. Going about by the national income accounting, the overall contribution of external demand from BRIC to SSA's GDP growth will be negative in such cases. In the period since the early 2000s, however, the net exports to BRIC have largely reversed to positive territories – often making positive contributions to SSA's growth spurts. This largely mirrors the tremendous growth in BRIC in this period and their rising demands for

⁴ Annex 2 shows how the contributions of net exports to SSA's GDP growth are computed.

commodities to fuel their growth. Among BRIC, China has been the primary driver of global commodity demand; from which SSA seem to have benefited significantly.⁵

Table 1: Contribution of NE to GDP growth, comparing OECD and BRIC

Calibration	NE/GDP (bill., USD current)		NE GROWTH		% point contribution of NE (i.e. External Demand) to GDP growth	
	$\alpha_t = \frac{(X_t - M_t)}{GDP_t}$		$g^{\alpha_t} = \frac{(\alpha_t - \alpha_{t-1})}{\alpha_{t-1}}$		$\alpha_t * g^{\alpha_t}$	
	BRIC	OECD	BRIC	OECD	BRIC	OECD
Trade Partner	BRIC	OECD	BRIC	OECD	BRIC	OECD
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1970	0.04	1.00	-	-	-	-
1971	-0.09	-0.59	-346.01	-159.03	0.31	0.94
1972	-0.04	0.59	-60.33	-199.29	0.02	-1.17
1973	-0.12	2.14	249.52	263.21	-0.31	5.63
1974	-0.23	5.84	83.24	173.00	-0.19	10.10
1975	-0.28	-0.02	25.92	-100.27	-0.07	0.02
1976	-0.27	1.10	-4.69	-7045.57	0.01	-77.20
1977	-0.26	-0.24	-3.84	-122.31	0.01	0.30
1978	-0.39	-2.68	48.50	995.61	-0.19	-26.66
1979	-0.27	2.81	-29.32	-205.12	0.08	-5.77
1980	0.00	0.08	-99.32	-97.15	0.00	-0.08
1981	-0.29	-1.83	15295.89	-2383.51	-43.66	43.64
1982	-0.32	-0.25	11.28	-86.47	-0.04	0.21
1983	-0.22	0.58	-31.15	-335.69	0.07	-1.96
1984	-0.21	3.65	-2.32	525.67	0.00	19.20
1985	-0.07	3.59	-67.22	-1.64	0.05	-0.06
1986	-0.17	0.76	146.20	-78.74	-0.25	-0.60
1987	-0.18	0.64	2.89	-16.19	-0.01	-0.10
1988	-0.18	0.71	0.34	10.28	0.00	0.07
1989	-0.19	1.22	4.26	73.16	-0.01	0.89
1990	-0.27	1.42	43.37	16.54	-0.12	0.24
1991	-0.20	-0.28	-23.40	-119.59	0.05	0.33
1992	-0.35	-0.86	69.42	209.39	-0.24	-1.81
1993	-0.16	-0.50	-53.05	-42.48	0.09	0.21
1994	-0.28	0.63	75.29	-226.77	-0.21	-1.43
1995	-0.23	0.25	-20.08	-60.87	0.05	-0.15
1996	-0.01	2.40	-96.99	873.60	0.01	20.96
1997	0.13	2.01	-2036.11	-16.04	-2.69	-0.32
1998	-0.50	-3.28	-478.29	-262.62	2.39	8.60
1999	0.32	-1.19	-163.73	-63.78	-0.52	0.76
2000	1.06	3.20	233.57	-370.04	2.48	-11.86
2001	0.18	0.79	-82.97	-75.22	-0.15	-0.60
2002	0.16	0.94	-11.03	18.33	-0.02	0.17
2003	0.18	1.17	10.45	24.66	0.02	0.29
2004	-0.31	1.54	-274.66	31.74	0.85	0.49
2005	-0.54	3.26	73.31	111.09	-0.39	3.62
2006	0.13	3.85	-124.71	18.11	-0.17	0.70
2007	-0.12	2.25	-191.50	-41.44	0.23	-0.93
2008	0.31	4.60	-355.95	104.23	-1.11	4.79
2009	-0.84	0.17	-370.23	-96.29	3.12	-0.16
2010	0.54	1.61	-164.24	840.47	-0.89	13.49
2011	0.29	2.84	-47.08	77.08	-0.13	2.19
2012	0.42	2.04	47.07	-28.11	0.20	-0.57
2013	-0.01	0.51	-102.93	-75.07	0.01	-0.38
2014	-0.78	-0.60	6249.38	-216.99	-48.85	1.29

Source: based on trade data from IMF's DOTS database and
national accounts data from World Bank's WDI database

On the other hand, the OECD have delivered surplus net exports figure to SSA, more frequently than BRIC economies (see column 3 of table 1). Further, unlike BRIC, there is no historical reversal of trade balances. Years of negative and positive trade balances appear to follow a

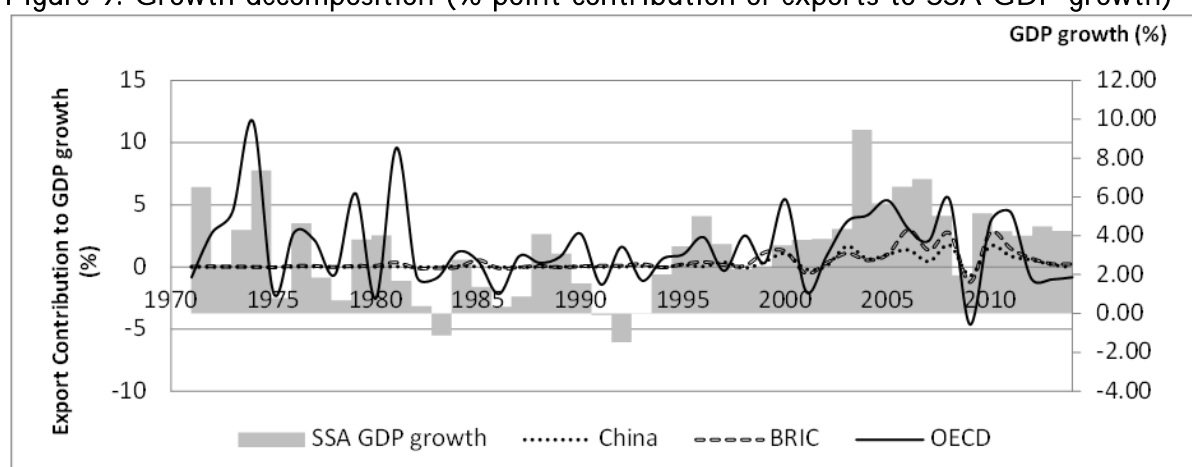
⁵ Lately, the brisk growth of BRIC is cooling down. This has coincided with the slowing of China, which has been the primary engine of global growth and prime consumer of commodities.

largely random pattern for the OECD countries (e.g. compare columns 2 and 3). If we factor out the fiscal years with extreme net export growths (which often arise from transitions between large deficit in one year to surplus in the other, or vice versa) and also consider the absolute figures (i.e. ignoring deficit or surplus), we can see that the net exports to OECD historically had a much bigger contribution to SSA's GDP growth (e.g. compare columns 6 and 7). This is especially true for the earlier years in our sample where the trade links between SSA and BRIC was 'relatively' smaller, as compared to the OECD.

Yet, it is rather difficult to see the contribution of external demand to GDP growth in its traditional definition as 'net exports' (Xing and Pradhananga, 2013). This is so since net exports tends to be very erratic as exports (positive) and imports (negative) pull the net figure in opposite direction. At best of times, where there is a balanced trade, net exports become zero or negligible. Instead, if we solely focus on exports, we would have a much clearer view of the rising contribution of BRIC (and the likes of China) as prime destinations for African exports.

Figure 9 shows the contribution of exports (by destination i.e. BRIC, OECD, China) to SSA's GDP growth. There are two interesting stories to read from this graph. First, the bar graphs (representing GDP growth) and the line graphs (representing export contribution) are more or less synchronized. This shows the extent to which SSA's GDP growth depends on its (commodity) exports to the outside world. The close trend and synchronization between global commodity demand (or price) cycles and SSA's growth cycle has been widely documented in the economic literature (Ademola, Bankole, and Adewuyi, 2009; Diallo and Tapsoba, 2014).

Figure 9: Growth decomposition (% point contribution of exports to SSA GDP growth)



Source: based on trade data from IMF's DOTS & national accounts data from World Bank's WDI

Second, one observes a clear difference while comparing the three line graphs that represent the contribution of exports to OECD for SSA's GDP growth vis-à-vis BRIC and China. Our foregoing analysis is of course comparing OECD and BRIC as a group. However, given the preeminent role played by China in recent times, it feels important to place it in the figure just for comparison. From Figure 9 we see that exports to OECD, over the whole period, waver far away from the horizontal zero line (which signifies zero export contribution to GDP growth). This means that increase/decrease in export growth to OECD has played a significant role of

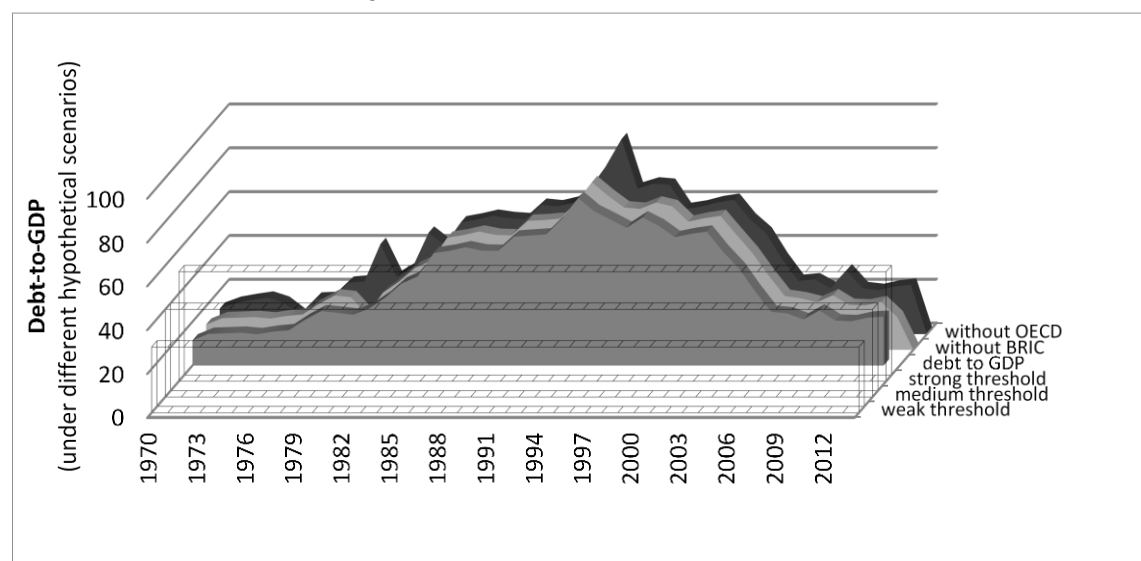
increasing/decreasing GDP growth in SSA. By contrast, looking at BRIC, we notice that the line graph was nearly flat up until the late 1990s. This implies that exports to BRIC had negligible impact on SSA's growth prospects. Since the early 2000s, however, we witness significant boost to GDP growth contributed by exports to BRIC in general, and China in particular. The export contributions of OECD and BRIC in this recent (post 2000) period also seem to be 'synchronized' and nearly 'balanced'. They are 'synchronized' in the sense that the graphs representing OECD and BRIC are rising and falling together. For instance, we see an upward trend in early 2000s, a downward trend around the 2008/09 global financial crisis period, and then a recovery in 2010/11 period and then falling back afterwards again. The export contribution of the two economic blocks is also 'balanced' or quite comparable in recent years, although the OECD still played a slightly bigger role.

The Debt to GDP ratio

Debt to GDP had been unsustainable in SSA from about early 1980s to mid-2000s using the weak and medium debt sustainability thresholds, which characterize most SSA countries (see Figure 10). If we use the strong sustainability threshold, we see that debt had not been sustainable in the periods spanning late 1980s to early 2000s. This historical pattern mirrors the sustainability analysis we conducted above using the measures of debt to exports and debt service to exports. However, unlike these two previous exercises, we do not see a similar massive change in debt sustainability in the hypothetical scenarios that exclude the export contributions of OECD and BRIC. This is partly straight forward since the former debt sustainability measures have 'export' figures as their denominators. For instance, reducing the value of exports to OECD will automatically raise the debt to export ratios and gives a much bigger weight to the contribution of OECD to SSA's debt sustainability. On the other hand, the debt to GDP ratio is going to be less affected by export swings as compared to the debt to exports ratio. This is easy to assume, given that GDP growth is going to depend on many factors besides exports.⁶ That is the reason why we don't see a big difference (in Figure 10) between the actual debt to GDP figure and the hypothetical debt to GDP figures determined by barring the external demand from OECD and BRIC.

⁶ GDP does not change proportionally to the changes in exports. It will take a simultaneous decline in consumption, investment, government expenditure and external demand (net exports) to comparatively skew GDP. Further, the fact that we are considering net exports (which theoretically have a zero value in a balanced trade scenario) to represent the external demand from either the OECD or BRIC means that there is a smaller deviation as compared to an alternative scenario where we might consider only exports.

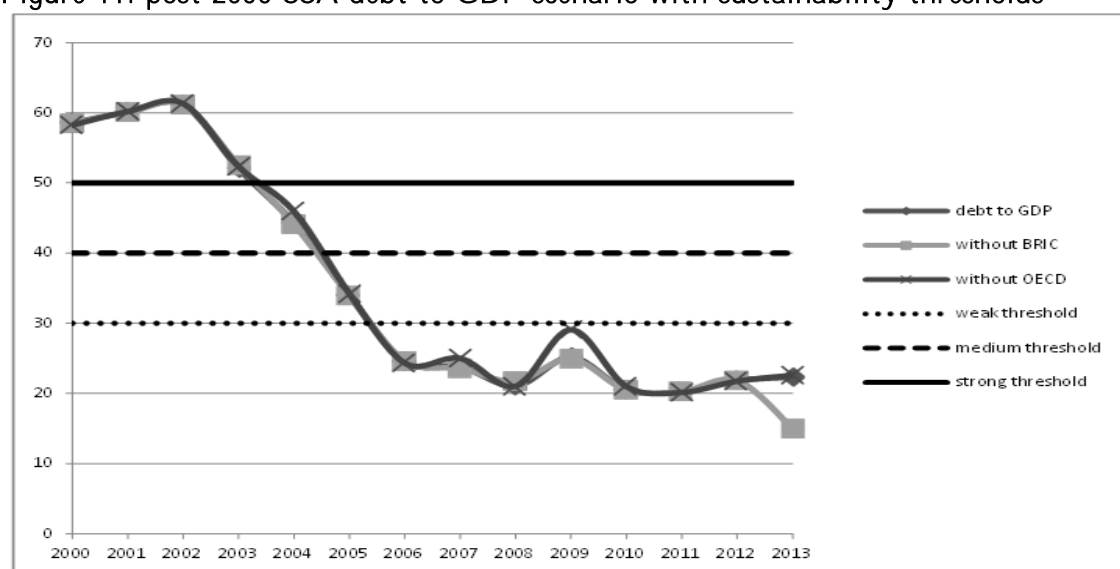
Figure 10: SSA debt to GDP (%) together with sustainability thresholds & hypothetical scenario of ‘no trade with given destination’



Source: based on World Bank's IDS and IMF's DOTS databases

Focusing on the recent (post 2000) debt to GDP scenario in Figure 11, we see that debt has been sustainable in SSA (measured against GDP) since about 2004, 2005 and 2006 if we use the ‘strong’, ‘medium’ and ‘weak’ sustainability thresholds, respectively. Further, unlike the debt to export and debt service to export measures, there is no considerable rise in debt sustainability concerns if international trade links with OECD and BRIC were taken out. In these hypothetical scenarios, debt to GDP has still remained tightly aligned to the actual debt to GDP ratio and has even remained within the weak sustainability thresholds in the post 2005 period. Even if there was the familiar hump in debt to GDP figures coinciding with the 2008/09 recession, the figure has still remained sustainable, even when using the most restrictive (weak) sustainability threshold.

Figure 11: post 2000 SSA debt to GDP scenario with sustainability thresholds



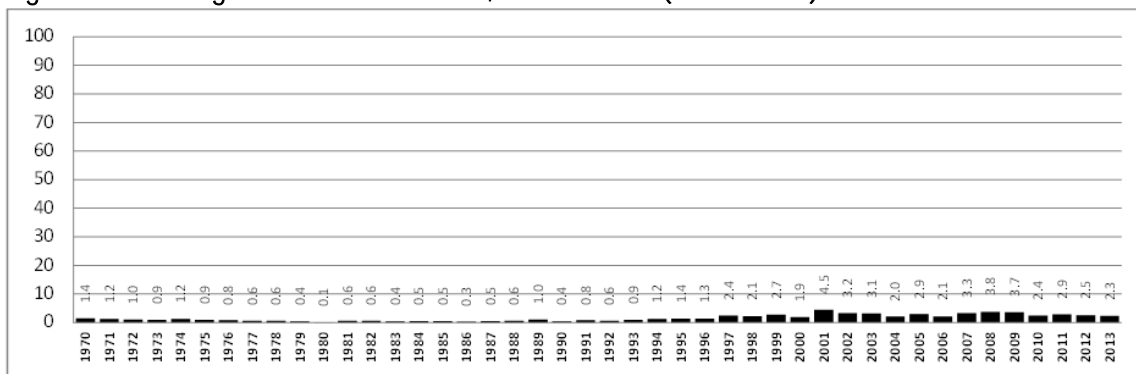
Source: based on World Bank's IDS and IMF's DOTS databases

4. Further notes on our debt sustainability exercise

4.1 On the contribution of FDI to GDP growth

In our analysis of BRIC and OECD's contributions to debt sustainability (using the measure of debt to GDP ratios), we only consider a hypothetical scenario of 'no exports'. This is due to lack of viable bilateral investment (i.e. FDI) data between respective African countries vis-à-vis OECD and BRIC partners. If investment figures were also discounted – just like exports, the hypothetical GDP will be even smaller. The impact would be 'relatively' bigger in those countries that receive larger foreign investment. However, given the fact that foreign direct investment figures in SSA are much smaller as compared to other developing regions, its omission would not make the results significantly skewed. For instance, according to World Bank's WDI dataset (see Figure 12), FDI as share of GDP still trails way below 5% of GDP in the SSA region. Even if nominal FDI figures are rising in recently years, their relative contribution to SSA's GDP is minor. The region's robust growth since early 2000s is largely driven by the service and agricultural sectors (McMillan and Harttgen, 2014). The recent rapid GDP growth rates, relative to unimpressive FDI growth, still yields low share of GDP for FDI in SSA.

Figure 12: Foreign direct investment, net inflows (% of GDP)



Source: based on FDI data from World Bank's WDI database

4.2 On the contribution of exports to GDP growth

As Lin and Li (2002) argue, the basic national income identity based analysis is going to underestimate the effect of exports on GDP growth because increases on exports can also have an effect on consumption, investment and imports. To remark this reality, we run regressions of consumption, investment and imports vis-à-vis exports. Since we basically want to show the trade elasticities for SSA countries, we use a simple bivariate model of the following form;

$$\log(Z_{it}) = \beta_0 + \beta_1 \log X_{it} + \varepsilon_{it}, i=1 \dots n \text{ and } t=1 \dots T \quad (1)$$

Where,

$Z_{it} = [C_{it}, I_{it}, M_{it}]$

C_{it} = Consumption of country 'i' at year 't'

I_{it} = Investment of country 'i' at year 't'

M_{it} = Imports of country 'i' at year 't'

X_{it} = Gross value of exports by country 'i' at year 't'

The above model is estimated via pooled least squares (PLS) and Fixed Effects (FE) models, where the latter regressions are intended to control for country heterogeneity within the sample. The dataset is an unbalanced panel of 45 SSA countries over the 1960-2014 period.⁷ As we can see from Table 2, the coefficients of exports in the three bivariate models (i.e. the elasticities of consumption, investment and imports with respect to exports) are all significant. This goes to show that a boost in SSA exports to OECD, BRIC or elsewhere in the world would augment not only imports but also consumption and investment figures. Therefore, the overall effect of exports on the economic growth would be larger in reality than what the simple national income accounting identity would tell us. This would specially be the case if the indirect positive impacts (of export growth) reflected in consumption and investment growth outweigh import growth. The implication of this being, rising exports to OECD and BRIC would play a vital role towards the dual policy targets of economic growth and debt sustainability in SSA economies.

Table 2: Regressing consumption, investment and imports on exports

	PLS	FE	PLS	FE	PLS	FE
	Consumption	Consumption	Investment	Investment	Imports	Imports
Country Effects	No	Yes	No	Yes	No	Yes
Exports	0.715*** (0.015)	0.612*** (0.014)	0.909*** (0.008)	0.945*** (0.010)	0.852*** (0.005)	0.922*** (0.006)
Constant	7.796*** (0.326)	9.946*** (0.298)	1.587*** (0.165)	0.857*** (0.201)	3.358*** (0.104)	1.948*** (0.123)
R ²	0.699	0.699	0.865	0.865	0.929	0.929
N	923	923	1933	1933	2100	2100
F(1, N)	2134.59	1864.32	12368.22	8934.82	27451.15	22894.72

Standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.010

4.3 Complexity of bilateral relation between SSA vis-à-vis OECD and BRIC

Our foregoing analysis doesn't capture the whole (complex) picture of SSA's relationship with OECD, BRIC and the rest of the world on trade, investment and aid flows. Namely, the inclusion of FDI, aid flows and bilateral debt would add an interesting and pragmatic dimension to the analysis.⁸ We would also like to remark that this leaves an interesting area of inquiry for future research. Yet, we try to reflect more on the complexity of SSA's bilateral relations with its economic partners and the impact this has on debt sustainability by particularly focusing on China, given its massive (though less transparent) presence in the SSA region. Even if neither the FDI data taken from UNCTAD (which is by itself taken from China's Ministry of Commerce)

⁷ The list of countries included in the panel regressions are: Angola, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Comoros, Congo Dem. Rep., Congo Rep., Cote d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

⁸ Given the limitations of accessing continuous (and reliable) bilateral time series data, the above exercise did not include these dimensions in the basic debt sustainability analysis given in section 3.

nor the aid flows and bilateral debt data taken from ‘AidData’ are fully accurate, they give some glimpse in to the trends in Chinese bilateral engagements in SSA.⁹

4.3.1 FDI trends (Chinese case)

In recent years, China’s investment in SSA has rapidly grown. For instance, over the decade spanning 2003 to 2012, Chinese FDI in to SSA has jumped from about 70 million USD to over 2.5 billion USD (see Table 3). Some of the biggest beneficiaries of Chinese FDI in the region include South Africa, Nigeria, Zambia and D.R. Congo. In the same period, Chinese global FDI footprint increased from about 2.85 billion to 87.80 billion USD. Another interesting observation of Chinese FDI has been the fact that much of it goes to other developing countries. Historically, China has benefited from the FDI that it received from advanced economies. China, in its own right, is now a large investor in other developing countries. For instance in 2012, Chinese FDI to developing countries amounted to about 70 billion USD while the same figure for advanced economies was about 13.5 billion.

Table 3: China’s FDI outflow by destination (Mill. USD)

Region / economy	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
World	2854.65	5497.99	12261.17	17633.97	26506.09	55907.17	56528.99	68811.31	74654.04	87803.53
Developed economies	211.44	335.51	730.68	519.51	2747.36	2787.17	7042.83	10863.95	13422.57	13508.35
Developing economies	2604.61	5065.24	11215.6	16564.98	22891.16	52054.8	48779.79	56735.91	60033.51	70016.64
Africa	74.81	317.43	391.68	519.86	1574.31	5490.56	1438.87	2111.99	3173.14	2516.66
North Africa	4.86	165.71	190.41	153.57	280.86	11.1	358.49	259.57	1153.45	365.12
SS Africa	69.95	151.72	201.27	366.29	1293.45	5479.46	1080.38	1852.42	2019.69	2151.54
Angola	0	0	0	22.39	41.19	-9.57	8.31	101.11	72.72	392.08
Botswana	0.8	0	3.69	2.76	1.87	14.06	18.44	43.85	21.86	21.1
Cameroon	0	0	0	0.73	2.05	1.69	0.82	14.88	1.87	17.65
Congo	0	0.51	8.11	13.24	2.5	9.79	28.07	34.38	6.81	98.8
Congo, Democratic Rep. of	0	11.91	5.07	36.73	57.27	23.99	227.16	236.19	75.18	344.17
Côte d’ Ivoire	0.62	6.75	8.74	-2.91	1.74	-7.02	1.51	-5.02	0.87	3.61
Equatorial Guinea	0	1.69	6.35	10.19	12.82	-4.86	20.88	22.08	12.47	138.84
Eritrea	0	0	0	0	0	-0.49	0	2.94	3.3	1.96
Ethiopia	0.98	0	4.93	23.95	13.28	9.71	74.29	58.53	72.3	121.56
Gabon	0	5.6	2.08	5.53	3.31	32.05	11.88	23.44	1.93	30.69
Ghana	2.89	0	2.57	0.5	1.85	10.99	49.35	55.98	40.07	208.49
Guinea	1.2	14.44	16.34	0.75	13.2	8.32	26.98	9.74	24.55	64.44
Kenya	0.74	2.68	2.05	0	8.9	23.23	28.12	101.22	68.17	78.73
Liberia	0	0.58	8.65	-7.03	0	2.56	1.12	29.89	21.09	12
Madagascar	0.68	13.64	0	1.17	13.24	61.16	42.56	33.58	23.1	8.43
Malawi	0	0	0	0	0	5.44	0	9.86	1.2	10.33
Mali	5.41	0	0	2.6	6.72	-1.28	7.99	3.05	47.58	44.42
Mauritania	1.7	0	0	4.78	-4.98	-0.65	6.53	5.77	19.69	30.87
Mauritius	10.27	0	2.04	16.59	15.58	34.44	14.12	22.01	419.46	57.83
Mozambique	0	0.66	2.88	0	10.03	5.85	15.85	0	20.26	230.52
Namibia	0.62	0	0	0.85	0.91	7.59	11.62	5.51	5.04	25.12
Niger	0	1.53	5.76	7.94	100.83	0	39.87	196.25	51.63	-195.94
Nigeria	24.4	45.52	53.3	67.79	390.35	162.56	171.86	184.89	197.42	333.05
Rwanda	0	0	1.42	2.99	0	12.88	8.62	12.72	9.69	5.02
Senegal	0.65	0	0	0	0	3.6	11.04	18.96	0	4.47
Seychelles	0	0	0	0	0	0	0	12.28	4.34	53.4
Sierra Leone	0	5.92	0.49	3.71	2.85	11.42	0.9	0	10.75	7.69
South Africa	8.86	17.81	47.47	40.74	454.41	4807.86	41.59	411.17	-14.17	-814.91
Togo	0	1.85	0	4.58	2.7	4.2	8.91	11.77	9.04	20.59
Uganda	1	0	0	0	4.01	-6.7	1.29	26.5	9.91	9.79
United Rep. of Tanzania	0	1.62	0.96	12.54	-3.82	18.22	21.58	25.72	53.12	119.7
Zambia	5.53	2.23	10.09	87.44	119.34	213.97	111.8	75.05	291.78	291.55
Zimbabwe	0	0.71	1.47	3.42	12.57	-0.72	11.24	33.8	440.03	287.47

Source: UNCTAD FDI/TNC database, based on data from P.R. China’s Ministry of Commerce (MOFCOM).¹⁰

⁹ On bilateral data such as aid flows, Brautigam (2010) documents the difficulty of getting data from major emerging economies (e.g. Russia, China, India, and Brazil).

¹⁰ Foreign Direct Investment (FDI) and Transnational Corporations (TNC)

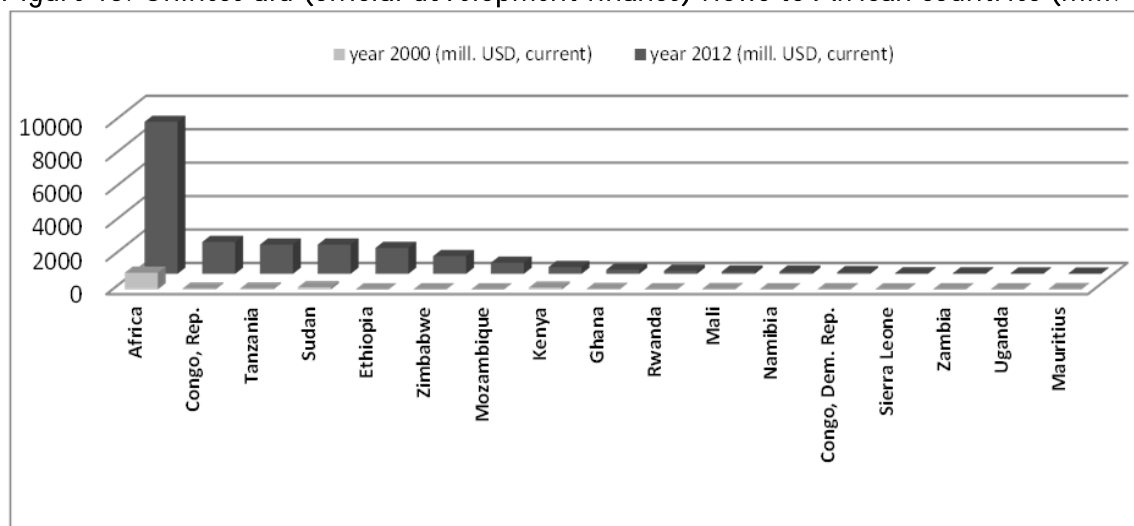
Even if we only showed Chinese FDI data above - as an example, the overall conclusion is that other BRIC (or OECD countries for that matter) play a useful role in boosting SSA's GDP growth via the investment channel.

4.3.2 Aid flows (Chinese case)

According to 'AidData', Chinese aid to Africa has risen from about a billion dollars at the turn of the century to over nine billion by 2012. Even if it is difficult to check the accuracy of these figures, what is evident is that there has been a remarkable ascent in Chinese aid flows (see Strage et al., 2013 for transparency problems of Chinese data). As can be seen from Figure 13, a simple comparison of Chinese aid flows in to specific SSA countries between years 2000 and 2012 would give a little clue. Some of the biggest beneficiaries (which received over a billion dollars in 2012 according to 'AidData') include; Congo Rep., Tanzania, Sudan, Ethiopia and Zimbabwe.

Once again, the conclusion out of this is that, aid flows (be it from emerging donors such as China or the traditional donors of the OECD group) play a role in boosting SSA's GDP growth. However, the literature of course documents some controversies regarding the empirical foundations of this argument. Some studies, such as Burnside and Dollar (2000) and Brautigam and Knack (2004), have shown that aid has in fact played a negative role in growth. This stands in contradiction with the traditional view of aid as a positive driver of growth in the developing world (Hansen and Tarp, 2000; Dalgaard, Hansen, and Tarp, 2004). Whatever the final verdict of this debate may be, it goes to show the complexity of the bilateral ties between SSA vis-à-vis OECD and BRIC.

Figure 13: Chinese aid (official development finance) flows to African countries (mill. USD)



Source: based on 'AidData' database (<http://china.aiddata.org>)

4.3.3 Bilateral debt (Chinese case)

Another essential element of the foregoing discussion should be bilateral debt. However, given the lack of continuous and reliable data, it has not been explicitly included in the analysis in section 3. Yet, it is important to show the trend especially with regard to the big emerging sources of finance, particularly China. Strange et al. (2013) use a novel technique to gather

information on the list of major Chinese deals in African countries and their amounts.¹¹ As the following excerpt (Table 4 below) shows, China has been pledging millions and billions of dollars for various mega projects in SSA. The channel of financing, the type of projects involved and the total sums budgeted varies greatly. Nonetheless, what is unmistakable is China's increasing role in funding big African infrastructure projects.

Table 4: Chinese bilateral loans, grants, export credits and debt forgiveness given to African Countries (in millions of US\$)

Year	Recipient	Project	Flow	Value
2000	Africa, regional	\$1 billion of African debt cancelled; may not be bilateral	Debt forgiveness	1697
2003	Cameroon	Memve'ele Dam	Loan	674
2003	Sudan	Construction of the Merowe hydroelectric dam	Loan	836
2004	Angola	Phase 1 of National Rehabilitation Project	Loan	1507
2004	Zimbabwe	ZESA Secures Funding for Lake Kariba Power Plant	Loan	1010
2006	Equatorial Guinea	\$2b oil-backed loan	Loan	2692
2006	Mauritania	\$3 Billion Loan for oil exploration, sewage systems, iron mine, road	Loan	4037
2006	Nigeria	Infrastructure in exchange for preferential oil right bidding	Vague	5383
2006	Nigeria	Light Rail Network	Loan	673
2007	Sudan	Construction of railway from Khartoum to Port Sudan	Export credits	1377
2008	Madagascar	Construction of hydroelectric plant	Loan	1421
2009	Angola	Agricultural development	Loan	1200
2009	Cameroon	Loan for water distribution project	Loan	775
2009	Ethiopia	Concessional Ex-Im Bank Loan for Dam Construction	Loan	2249
2009	Ghana	\$3B USD loan from China Development Bank for oil project, road project, others	Loan	3000
2009	Mauritius	East-West Corridor, Ring Road, Bus Way, and Harbour Bridge	Loan	782
2009	Mozambique	China builds Agricultural Research Center/Agriculture Station	In-kind Grant	700
2010	Ghana	China grants \$6b concessionary loan	Loan	5485
2010	Zambia	Chinese firm to build Kafue Gorge power plant (2010 commitment)	Loan	930
2011	South Africa	Financial Cooperation Agreement	Loan	2072

Source: Strange et al. (2013; Page 33)

However, as we have shown before (Figures 2) bilateral debt is still a smaller component of overall debt in most SSA countries, particularly the less developed ones that cannot borrow on

¹¹ Given the difficulty of acquiring official figures on Chinese aid flows, researchers at AidData use an innovative technique to gather data. Specifically, they used 'media-based data collection (MBDC)' methods to track project-level Chinese development finance. They explain how MBDC can be used to work around bilateral and multilateral development organizations that do not share data (Strange et al., 2013).

non-concessional terms.¹² Most SSA countries still primarily depend on concessional (and multilateral) sources of debt to finance their numerous development projects.

5. Conclusion

In this paper, we undertake a basic and alternative debt sustainability exercise in SSA economies. In doing so, we try to address various issues surrounding the debt notion. First, we analyze the historical and recent trends of debt sustainability in SSA economies. In this regard, we try to examine the evolution of debt over a period spanning more than four decades. The results of this exercise shows that, first debt levels across countries of SSA region has risen from ‘relatively’ low levels to highly unsustainable magnitudes from about late 1980s to early 2000s, where the peak levels have been reached for most countries in the 1990s. This basically conforms to the evidence presented in the contemporary debt literature.

Additionally, our exercise borrows the debt sustainability thresholds used in the joint IMF-World Bank DSF analysis.¹³ We compare these ‘desired’ debt thresholds to (i) the ‘actual’ debt ratios and (ii) our own ‘hypothetical’ debt ratios which represent the contributions of OECD and BRIC. The hypothetical debt ratios are ‘what would have materialized’ if the contributions (e.g. external demand) by the two partner economic blocks were assumed to be absent. We can think of this as a sort of ‘stress test’ (i.e. major shock) on the debt sustainability scenario. Surely, this will lead to elevated debt ratios, relative to exports and GDP. What is of interest to this paper is, by how much the ‘hypothetical’ scenarios would elevate the debt ratios of SSA. While answering this, it is more sensible to focus on the post 2000 period. This becomes apparent, given the fact that ‘actual’ debt levels were already unsustainable for the SSA region in the decades before. The results show that the two export based measures of debt sustainability, namely debt to exports and debt service to exports, would be highly susceptible while debt to GDP much less so. This result is also evident since ‘export’ is explicitly stated as the denominator of the former two debt measures. Yet, it is interesting to see that in recent years (especially in the post global financial crisis period), SSA region’s debt profile seems rather sustainable and resilient to the ‘hypothetical’ export shocks from OECD and BRIC. This stands in stark contrast to the historical evidence, where debt was mostly unsustainable.

We also compare the historical contributions to debt sustainability by OECD and BRIC – with one another. The objective of this is to determine the relative importance of OECD and BRIC for SSA’s debt sustainability. We also assess how the roles of the two major economic blocks (i.e. OECD or BRIC) have evolved overtime. This has been an interesting exercise since it has revealed the rapid rise of BRIC (particularly China) in their role as a major export market of SSA economies and how this fits in to the ‘indirect’ role of fulfilling debt sustainability in SSA economies (e.g. by depressing debt to exports ratios). Particularly, the analysis of recent trends

¹² At the core of the discussion about what levels of ‘debt-to-GDP’ are sustainable for countries at different levels of economic development is also a debate about the complex link between the nominator (debt) and the denominator’s growth (i.e. GDP or economic growth). In this regard, there is a rich and ongoing discussion as can be seen from Panizza and Presbitero (2013; 2014), Eberhardt and Presbitero (2015), Megersa (2015), Megersa and Cassimon (2015).

¹³ The DSF is the current formal debt sustainability framework used not only by the IMF and WB, but also by governments and policy makers of developing countries and various multilateral institutions (see Section 2.2).

(i.e. post 2000 period) has shown that BRIC have done a phenomenal role of catching up with their OECD cohorts. However, our exercise has also uncovered the overwhelming historical role of the OECD countries in this regard.

In addition, we also try to reflect up on the complex and multifaceted bilateral interaction between SSA economies and their OECD and BRIC partners by focusing on FDI, aid flows and bilateral loans. The additional analysis complements the basic empirical exercise - which omits these areas of bilateral relations due to data constraints and methodological intricacy. In analyzing these latter aspects, we particularly focus on China since it delivers an interesting example in to the rapidly evolving bilateral relations between SSA and the outside world. Our analysis shows that new actors such as China (just like the traditional OECD partners) are having significant involvement with SSA economies. This also has a clear positive trend where the flow of foreign ‘development’ funds via FDI, aid and loan packages appears to be accelerating over the years. The overall implication of this is that SSA’s development partners play a bigger role to the region’s growth prospects, i.e. much more than what their contribution as trade partners would suggest. This, ultimately, makes them crucial to the region’s dual long term objectives of balancing economic growth with debt sustainability.

Annex 1

Contribution to debt sustainability (OECD Vs. BRIC)

We examine the Contribution of OECD and BRIC to debt sustainability in African countries via exports as follows. Suppose $Debt_{it}$ represents the debt owed by country ‘i’ at time ‘t’, $Export_{it}$ = Gross value of exports by country ‘i’ at year ‘t’, $Export_{BRIC\ it}$ = Value of exports to BRIC by country ‘i’ at year ‘t’, and $Export_{OECD\ it}$ = Value of exports to OECD by country ‘i’ at year ‘t’; we could represent the debt to exports ratio in the ‘hypothetical scenario’ of no exports to OECD as (in %);

$$\left(\frac{Debt_{it}}{Export_{it} - Export_{OECD\ it}} \right) * 100 \quad (2)$$

We could then assess the contribution of OECD countries to the debt sustainability of African countries (via export channel) by comparing the above hypothetical ratio (equation 2) with the actual debt to exports ratio. In a similar fashion to equation 2, we capture the debt to exports ratio in the ‘hypothetical scenario’ of no exports to BRIC. We also examine the hypothesis that the relative contribution of the OECD (via the export channel) to African countries’ debt sustainability is higher than that of BRIC. We approach this as;

$$\left(\frac{Debt_{it}}{Export_{it} - Export_{OECD\ it}} \right) > \left(\frac{Debt_{it}}{Export_{it} - Export_{BRIC\ it}} \right) \quad (3)$$

This would mean that the OECD countries play a bigger role to debt sustainability measured against exports (at year ‘t’). However, we will also look at the historical evolution of the contribution of BRIC and OECD to debt sustainability on the above measure. This is important to do since there is a presumption that BRIC are playing an increasing role as compared to OECD.

We also analyze if the contributions of BRIC and OECD to debt sustainability enables SSA countries to meet the specific debt sustainability requirements of the DSF. We will do so by testing whether the DSF debt targets (thresholds) are still met in the ‘hypothetical’ absence of exports to BRIC or OECD. Given

the heterogeneity of developing countries on the bases of policy strength and institutional qualities (Figure 3 in section 2.2), the DSF sets three categories of debt sustainability thresholds for debt-to-exports¹⁴;

$$\left(\frac{\text{Debt}_{it}}{\text{Export}_{it}}\right)_{\text{Threshold}} = \begin{cases} 100\% \text{ if weak policy } \text{CPIA} \leq 3.25 \\ 150\% \text{ if medium policy } 3.25 < \text{CPIA} < 3.75 \\ 200\% \text{ if strong policy } \text{CPIA} \geq 3.75 \end{cases} \quad (4)$$

The assessment we make can be stated as;

$$\left(\frac{\text{Debt}_{it}}{\text{Export}_{it} - \text{Export}_{\text{OECD } it}}\right) > \left(\frac{\text{Debt}_{it}}{\text{Export}_{it}}\right)_{\text{Threshold}} \text{ and/or } \left(\frac{\text{Debt}_{it}}{\text{Export}_{it} - \text{Export}_{\text{BRIC } it}}\right) > \left(\frac{\text{Debt}_{it}}{\text{Export}_{it}}\right)_{\text{Threshold}} \quad (5)$$

That is, we argue that in the absence of export links to OECD or BRIC, country ‘i’ will not achieve the DSF targets since this will lead to high debt to exports ratios. We will also conduct an analysis for ‘debt service to exports’ and ‘debt to GDP’ ratios in a similar fashion to the analysis we make for the debt-to-exports ratio above (steps 2 to 5 above). Within the framework of the GDP channel, we examine the Contribution of BRIC and OECD to debt sustainability in SSA countries via GDP growth as indicated in Annex 2. However, we use different thresholds for ‘debt to GDP’ ratio for the three categories of policy/institutional qualities in SSA economies. The debt-to-GDP sustainability thresholds (as in IMF-WB DSF) are given as;

$$\left(\frac{\text{Debt}_{it}}{\text{GDP}_{it}}\right)_{\text{Threshold}} = \begin{cases} 30\% \text{ if weak policy } \text{CPIA} \leq 3.25 \\ 40\% \text{ if medium policy } 3.25 < \text{CPIA} < 3.75 \\ 50\% \text{ if strong policy } \text{CPIA} \geq 3.75 \end{cases} \quad (6)$$

In the absence of trade and investment links to OECD or BRIC, we hypothesize that country ‘i’ will not achieve the DSF targets since this will increase the debt to GDP ratio – by depressing its GDP.

Annex 2

Determining the contribution of OECD and BRIC to SSA’s GDP growth

Our estimation of the contribution of export growth to GDP growth is based on the basic national accounts identity, namely:

$$Y_{it} = C_{it} + I_{it} + G_{it} + (X_{it} - M_{it}), \quad i=1 \dots k \text{ and } t=1 \dots n \quad (7)$$

Where,

Y_{it} = National income of country ‘i’ at year ‘t’

C_{it} = Consumption of country ‘i’ at year ‘t’

I_{it} = Investment of country ‘i’ at year ‘t’

G_{it} = Government Expenditure of country ‘i’ at year ‘t’

X_{it} = Exports of country ‘i’ at year ‘t’

M_{it} = Imports of country ‘i’ at year ‘t’

If we differentiate the above equation with respect to time (t), we will get the following expression:

$$\tilde{Y}_{it} = \tilde{C}_{it} + \tilde{I}_{it} + \tilde{G}_{it} + (\tilde{X}_{it} - \tilde{M}_{it}) \quad (8)$$

Where, $\tilde{Y}_{it} = \frac{dY_{it}}{dt}$ and so on for the other terms.

¹⁴ See IMF and World Bank (2012) for the debts sustainability thresholds within the DSF analysis.

If we represent the net exports part of the right hand side equation (i.e. $\tilde{X}_{it} - \tilde{M}_{it}$) with \widetilde{NE}_{it} , we may present the above equation as:

$$\tilde{Y}_{it} = C_{it} + I_{it} + G_{it} + \widetilde{NE}_{it}, \quad i=1 \dots k \text{ and } t=1 \dots n \quad (9)$$

For further analysis, we may again rewrite the above left and right hand side terms as follows:

$$\frac{\tilde{Y}_{it}}{Y_{it}} = \frac{C_{it}}{C_{it}} \frac{C_{it}}{Y_{it}} + \frac{I_{it}}{I_{it}} \frac{I_{it}}{Y_{it}} + \frac{G_{it}}{G_{it}} \frac{G_{it}}{Y_{it}} + \frac{\widetilde{NE}_{it}}{\widetilde{NE}_{it}} \frac{\widetilde{NE}_{it}}{Y_{it}}, \quad i=1 \dots k \text{ and } t=1 \dots n \quad (10)$$

In this setting, the ratios $\frac{C_{it}}{Y_{it}}$, $\frac{I_{it}}{Y_{it}}$, $\frac{G_{it}}{Y_{it}}$ and $\frac{\widetilde{NE}_{it}}{Y_{it}}$ represent the shares of national income accounted by consumption, investment, government expenditure and net exports; while the ratios $\frac{\tilde{Y}_{it}}{Y_{it}}$, $\frac{C_{it}}{C_{it}}$, $\frac{I_{it}}{I_{it}}$, $\frac{G_{it}}{G_{it}}$ and $\frac{\widetilde{NE}_{it}}{\widetilde{NE}_{it}}$ represent the growth rates of the respective variables.

The four right hand side additives of Equation (10) represent by how much GDP would grow following a growth in any of these parts. For instance, $\frac{\widetilde{NE}_{it}}{\widetilde{NE}_{it}} \frac{\widetilde{NE}_{it}}{Y_{it}}$ or $\frac{\widetilde{NE}_{it}}{Y_{it}}$ represents the growth in GDP as a result of a corresponding growth in net-exports while $\frac{\tilde{X}_{it}}{X_{it}} \frac{X_{it}}{Y_{it}}$ or $\frac{\tilde{X}_{it}}{Y_{it}}$ represents the GDP growth attributable to growth in gross export value of goods and services.

By splitting net exports by its destination in to BRIC, OECD and the rest of the world (ROW), we can make comparisons about the relative importance of these trade partners to SSA countries' GDP growth.

That is:

$$\widetilde{NE}_{it} = \widetilde{NE}_{OECD \ it} + \widetilde{NE}_{BRIC \ it} + \widetilde{NE}_{ROW \ it}, \quad i=1 \dots k \text{ and } t=1 \dots n \quad (11)$$

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